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Presentation: Lessons Learned Case Study

I am one of the founders and CEO of E-World Recyclers I have been involved in the industry for a number of years, just to give you some guidelines as to who I am. I have been involved in the start-up from start to finish of several what I would call successful recycling facilities in California. California, being a very difficult place to setup and operate as an electronic recycler, I have been able to watch the industry change.

I would say that the most consistent thing about this industry is that it always changes, and it has changed dramatically in the last 6 or 7 years. What we're going to talk about with the presentation is going to be about the actual recycling of the product, how do you do it, what you do with it, how do you maximize your profit on it, and some of the struggles and challenges we've found over the last 6-7 years and how to combat those challenges.

Before I even get started on that, I have to address one thing here is that I'm going to borrow something I heard from a friend of mine the other day which was "There seems to be a healthy tension in the room today." Just sitting in the back I noticed that there is a healthy tension between the people of Mexico and their desire to want to do something, and the people who are here doing presentations who have already done something. I wanted to just say that is what builds this industry, and that's how this industry is born is that recognizing that there are issues that need to be addressed and having people that have already done it come here and tell you this is our experience. So I think rather than be frustrated at the fact that Mexico doesn't have a whole lot of recycling processes or procedures set up right now, I think the best thing to do would be to look at this and say "You guys are in an enviable position because you can learn from our mistakes. You get to learn from the things we did wrong, and you don't have to do them. So it makes it a lot easier for you guys to learn that way." So we're going to get started in a little bit, and as I said, I wanted to clarify that. I think in our industry, it's a very enviable position to be in.

I think one of the things you are going to notice about me is that I absolutely love this industry. I enjoy what I do every day. I am very fortunate and blessed to be a part of this, and anybody who gets involved with this in Mexico now, it's still a young industry and it's going to grow. So there are growth opportunities, and those growth opportunities represent opportunities to make money. I'm not sure how many of you have ever seen this because the reality of that picture is that's like having money in a trashcan. The picture is probably 7 or 8 years old. I put it in there for a couple of reasons. The first reason is that it is definitely not the answer anymore. Unfortunately for this industry, is that for 15 or 20 years it was the answer. So this is an educational process. People have to get educated that this is not the best thing to do with this product. You should not throw it away. I look at that and say, "Well, there's 20 or 30 pounds of copper wire and some computers and circuit boards, and to me that represents $60-70 right there." The reality is with the correct recycling procedures, and I'm not talking multi-million dollar procedures. I heard that earlier. It doesn't have to be multi-million dollars to make money in this industry. The reality is effective separation, whether it's by hand or by machine can turn that into money.

I'm not sure how many people have actually seen this. This is a container of equipment that came in after the earthquakes in Hawaii. It was shipped to us, and I kind of reversed the usage of this in saying that "shipping material out in that condition is definitely not the solution." There are 2 or 3 things that are wrong with that process. The first thing that is wrong with that process is that it's in violation of many U.S. rules and regulations. The second thing that is wrong with that process is that you're throwing away money. There's money in that container. There are different ways to separate out the circuit boards, the plastics, the chords, the cables, and the glass and turn it all into positive revenue.

I put these pictures in for a reason because I wanted to show the difference of what I showed in the dumpster in a picture that is 7 or 8 years old as far as what was e-waste then and what is e-waste now. As

you can see the e-waste now consists of vacuum cleaners, microwave ovens, various types of cables and chords and speakers. I see a laptop down here. I see a small server over here. Pretty much anything that has a plug, depending upon where you live, can be classified as electronic waste. Anything that has a plug will have a circuit board. California has taken the aggressive approach and said "if it has a circuit board it should not be thrown away, therefore it should be recycled." So we're seeing quite a difference in the types of material that are now coming in for recycling than we did 5 or 6 years ago. 5 or 6 years ago it was all about computers, fax machines, copiers, monitors, televisions. Now you're seeing quite a diversity of material, and the reality of that is in 2 years it is going to change again.

You're going to see another change in this industry depending upon where you live and what regulations are in place. I have to say this also, the guys that were sitting up here for the last group of presentations had a lot of what I would call big scary words: regulations, legislation; all these things that are scary to somebody new in the industry. I want to tell you that seven or ten years ago, they really didn't exist. So we were all sitting right where you're sitting now a few years back, wondering how we're going to handle the problem and how we're going to do it effectively. That group of guys is probably the who's who of electronic waste in the United States. They are very friendly and very aggressive in helping companies to do this the right way. They are not there to slap you with a fine or slap your hands and say you did it wrong. They are there to tell you how to do it correctly, so I wouldn't be apprehensive or intimidated by the language that was consistent through the last group of presentations. It's what's happening in our industry in the United States. It is not going to happen to a brand new industry in Mexico initially. It's going to slowly grow into what are the best regulations, and again you get to pick and chose what works best here just like we did up there.

Creating cleaner streams. Copper, plastic, steel, aluminum, and especially CRT glass, and this is very important especially to the person with the million and a half dollar machine or a million and a half startup costs. Yes there are ways to recycle this product with machinery, and you can spend lots of money. At the end of the day, you're going to have a stream of product that is potentially contaminated. No matter what you do to clean that contamination up, you can't clean it. The best way to clean it up is to do a pre-sort and pre-separation by hand before feeding it into the machine. That way you can clean up the streams a little bit better. So whether by hand or by machine, the cleaner the product stream, the more opportunity we have to reach the highest paying markets.

This is all about markets: plastic, copper, steel, and glass. All traded globally on the exchange. The prices obviously change, and they certainly change for the better if you can clean up those streams to be cleaner. So the idea behind a successful recycling facility is can you implement a process or procedure that can clean those streams up, make those streams somewhat valuable. I'm not saying you have to clean them up to where they are bright shiny copper and take all the coating off of it. Let another person who does that as a specialty do that, but segregate and separate to achieve the highest value that you can for what you're actually touching. That's a smart business plan. Creating cleaner streams reduces the likelihood of improper disposal. This is as basic as they come. If people are buying your material, they are a lot less likely to throw it away. If somebody is paying for product, they're not going to throw it in the trash. They are going to try and reclaim some value out of that product whether they have to clean it up a little bit better or separate it a little bit better. They are going to try and generate some revenue because they spent revenue to get it.

Creating cleaner streams increases the amount of raw materials being reused to make new products which saves natural resources and energy. I think that's pretty much what all the environmentalists are complaining about. There's not going to be enough of these raw materials out there for us continue robbing the Earth of these things for the rest of our eternity. Now it may not happen in my lifetime or your kids' lifetime, but eventually what will happen is it will run out. So we need to start finding ways to regenerate that product that we're taking and recycling is one of the better ways to do it. Hand separated cables. Hand separated cases. Hand separated mice and keyboards. Hand separated shells, LCDs on the top of the laptops, and I believe these are actually from car DVD players. All of them have a value. 70 cents a pound on cables. Clean steel - 6 or 8 cents a pound. No machinery needed to get it to this form, just labor.

Everybody wants to know why everything is going to China and it is because the labor is cheaper in China. We've had this hidden fear of the Chinese market and "oh it's so terrible to go to China, and it shouldn't go to China." I can tell you from my experience in the last 8 years, everything goes to China. There is nothing that is spared. All the manufacturing is done in China. If anybody is trying to tell you differently, then you really need to look at them closely because the reality is that it is all ending up there. All the manufacturing is done over there. It only makes sense to send the raw materials over there so they can make more. There is a huge difference between sending container loads of potentially dangerous and potentially hazardous material than there is sending over separated streams of commodities. Separated streams of commodities increase the value and decrease the likelihood of it being improperly disposed of. It's a basic theory.

Monitors, keyboards, fax machines, printers, computers, hard drives, copiers, phone systems. This was the e-waste that we were seeing for a consistent five years. Now as I said, it's changed now. We're seeing hairdryers, shavers, toaster ovens, blenders, microwave ovens, light fixtures, light ballasts, and toys. It's changed to where we're still seeing a lot of the old faxes, copiers, scanners, printers, and monitors, but we're increasing our flow of product by seeing all these other things that are now deemed potentially hazardous and need to be recycled. All those things on the left hand side, when separated, create all those things on the right hand side. Glass can be separated. Copper can be separated. Steel can be separated. Aluminum can be separated. ABS plastic, precious metals can be separated. Now I'm not saying setting up a recycling facility means that you have to be a precious metals refiner. That's not a healthy thought, but can you separate out the materials that contain precious metals and send it somebody who can pay you the highest paying market value on those products. That's a much easier and much better thought out way to look at a recycling facility. There is value in the scrap.

This is a few pictures from our facility up in Vista, California, and yes we have bought some equipment. We have tried to make it as economically conventional to create the cleanest streams of products: aluminum products, shredded circuit board products, build plastic products, whatever it may be. We spent some money on machinery, and some of that machinery looks like this. This is a dual RAM auto-tie bailer. It runs around $135,000. It can take anything and bail it into a block; anything from a printer, a fax machine, a copier, a scanner, a server cabinet. What you see up in the right hand corner would be the backs from monitor boards heavily laden with aluminum, and copper. All of it has value, but as you work through this process of what's the best way to separate, your next logical thought is "what's the best way to size reduce or increase the amount of material that you are shipping," because you're going to want to cut your shipping cost down. Bailing product gives me the ability to send 1,500 pounds in a bail or several thousand pounds in shredded material, and it also allows us to achieve that warm fuzzy feeling that everybody wants to know that all their material has been destroyed.

One of the key elements, and this is not a plug for our company, this is more of an industry type conversation. Not a presentation. This is an industry conversation, but one of the key elements that we've learned is that effective size reduction, separation, and maximizing your shipping value all comes down to how much money the company makes. You're losing money if you're shipping 20,000 pounds on a truck because the truck can accept 40,000 pounds. We try to maximize that value for everything that we do. We also try to make sure that the larger clients, who are mandating that the material get destroyed, can come into our facility. There is a process in place that we can show that it is actually getting destroyed.

The biggest challenge facing any electronics recycler is the challenge of managing CRT glass. I am going to say this again because this is very important: CRT glass is the heaviest part of the electronic waste stream, period. It is what we see the most of. It's what everybody is afraid of. It's what's been banned by 7 or 9 different states in the United States. It's what programs have been set up to run around in California, Maine, and Connecticut. There are various programs governing the disposal of CRTs or I should say lack of land-filling CRTs and correct disposal. It is the biggest challenge that any recycler faces.

So I want to spend a little time talking about how the industry has progressed, how the industry has changed, what's happening with the glass, what used to happen with the glass, and what's now happening with the glass. It has changed, and in the reality of CRT talk, it's going to change again. CRTs were a thing of yesteryear. LCDs and flat screens are the things of today. They are getting cheaper and cheaper

every week. CRTs are becoming less and less appealing. They're bigger, they're heavier, more unsightly, less appealing, and people want to get rid of them. So what does that mean? That simply means that we've run the CRT life until the end of its useful life. It's going to go away. That doesn't change the fact that there are still millions of them that are going to be pulled in from various households and corporations and companies from around the world that need to be recycled. But they are not going to be using the glass to manufacture CRTs for a very long time. It's slowly thinning out, and it's going to stop.

We've watched in the United States the closing of 4 or 5 different CRT plants. Sony closed down. Techniglass[sp?] closed down. Asahi closed down, and I'm sure that there others that I don't have at the top of my tongue, but the reality is that the CRT industry certainly has changed from when I started in the industry in 2002. CRT glass is hazardous by nature. It contains large amounts of lead on the funnel portion of the CRT. 9 U.S. states have banned CRTs from landfills. They have done the research. They say it leaches into the ground. There may be discrepancies or disputes about whether this does or doesn't happen, but the reality is the regulators are saying pretty consistently now "we don't want it in our landfill." The recycler has to have a process to do something with it. CRT glass requires stringent handling requirements. CRT glass is classified mostly, and this changes state by state, mostly classified as a hazardous waste. Now they've created a specialized category or subdivision of this hazardous waste category and they call it "universal waste", which simply means it still tests hazardous but it doesn't have to be manifested to be moved around. The packaging requirements are a little less, but they are still there, and it's more about the handling requirements than being manifested as a hazardous material. CRT glass market is dwindling. We just talked about the various CRT manufacturers that have closed down in the United States. I can tell you that that has carried over into Asia. Samsung is the 800 pound gorilla here buying up all the glass from everybody and Samsung is closing down plants rather quickly. Sporadic plant closures and sporadic rejections of taking any domestic glass from us create problems for recyclers who are operating within a program here in California. We're all banking on that recycler taking our glass so we can claim our dollars from the state. If the glass doesn't move then we can't get paid. So sending it to Asia to have them sporadically close their doors and reject it or not accept it is certainly not the most efficient use of that stream of product. We have to have a better accountability of it. Samsung closed down a furnace in Korea in the middle of this year, and they claim to be closing the second furnace by the end of the year. That's going to put a big dip in the amount of CRT glass going over to the Asian market. Once again CRT glass is the largest portion of electronics waste stream simply because it is the heaviest.

Now we're going to talk a little bit about effective CRT management. How do you handle the CRTs? What do you do with them? This is another picture from our plant up in Vista, California. Traditionally the industry has changed. I think what's happened with the CRTs has happened with a lot of different streams of product. CRTs were easy to be thrown into a machine to have them destroyed. A hammer mill, shredder, or a pulverizer would take the glass, break it and then feed it on a conveyer. Sometimes it would remove all the metal, sometimes it wouldn't. What would happen is the glass that was coming out of those machines had some issues with contamination. The flip side of that is those machines had value because they could process large amounts of glass quickly. Is there a happy medium is the question. So there are various automated CRT processes.

This is a CRT breaking system that the company I was part of bought and put into Vista in 2003. Let me tell you, when we bought it, it was the best thing since sliced bread. It was gobbling up CRTs. It was the second facility in the state of California that actually installed a machine that could handle breaking them. It had a long conveyer feed. 1 tube every 3 to 5 seconds would break. It would climb up the conveyer, drop into a hammer mill spinning shaft with flexible steel hammers on the end of them. It would break the glass into smaller pieces. It would feed on a conveyer to the back of the machine. As you can see what's happening was when this whole thing was happening, there is a lot of ducting and a lot of air reclamation, HEPA filtration system, and dust collection system on the backside siphoning off all of the air-born residuals into a large bag house. The product would continue on a conveyer. This was a metal discharge, magnetic separator. The cross magnet would pull the steel frames out, they would drop out the side, and the glass would drop out the back. You could process millions of pounds a month. It was a great machine. It costs around $320,000.

Shredding systems are very similar to the breaking systems. Various shredding systems currently in use in the United States are very similar to what I just showed you: conveyer feed, hammer mill, drop into a shredder, breaks the glass, siphons off the metal, separates the two, sometimes good sometimes bad depending on the weight of the glass or how much glass got caught up in the middle. The reality is that these machines were not cranking out the best glass. CRT is 2 different types of glass leaded in the funnel, non-leaded in the panel. This machine, obviously right here, is a leaded portion of glass. The front, the panel of this, is non-leaded. The machine did not differentiate between leaded and non-leaded. It simply smashed the glass, removed the metal, and spit out the glass siphoning off all of the dust. They all do the same thing ranging in price from, on the low end, $300,000 to as high as $750,000. Pros of the machine: high volume output, it could process one CRT every 3-5 seconds, minimal amounts of labor required, the machine was doing most of the work. All you had to do was separate off all the plastic, pull out the CRT tube itself, put it on the conveyer, and the machine did the rest. It was very fast and efficient. It had a fully contained HEPA filtration system. The breaking environment was separate from the employees. Initially there were no real lead hazards to the guys around the machine. The cons: very expensive [$300,000 plus], potential lead issues. Some of the machines if the filters would get filled up and you didn't catch the filter or didn't change the bag house; you may have some residual lead dust floating around the building. It produced a co-mingled and contaminated glass. The disposal costs of the glass were high. When the glass was coming out of these machines, it was 2 types of glass mixed together into 1 stream: panel and funnel. As the glass came out the back, it was mixed together, it would drop into a box, it would pulverize itself because you're filling that box up with 3,000 pounds. On the bottom of that box, there's no determining whether it was panel or funnel. It was just simply dust or broken glass.

Here are some examples (on slide) of what the cut looked like when it came out of these machines. Interesting things about these photos is that these photos are from Asia, from glass that we sent to Asia that we thought was good. The reality of it was that the glass would get dumped into the box and you couldn't see what was on the bottom of the box. We didn't know that there were still metal frames in the glass. We didn't realize that it was doing a poor job of removing all of the frames. These are actually called shadow masks. The machine was doing the best that it could do, but as I said, there were lots of contaminants that did not get removed from the glass. The difference between that and today's technology, and again it has changed. The CRT industry has changed. EPA has come up with laws and rules saying that you cannot ship co-mingled glass. You have to separate the glass. So now a recycler who is generating large amounts of glass gets faced with what is the best way to separate. What is the most efficient and cheapest way to buy a machine that can separate? Then you got to filter in all the different laws from your state and regulators and all the different things we all talked about. What this machine does, this is a Chinese made machine brought into the U.S. by us, it separates cleanly the panel and funnel glass. It is called a hotwire separator. It comes in a package like this. It wraps a hotwire around the panel glass and heats the hotwire up for about 30-45 seconds depending on the size of the glass. It de-energizes that heat, and at that same time that the heat is turned off there are blasts of air that hit all 4 corners. The cold air on the hot glass causes the glass to fracture, and you separate the 2 different types of glass. So what you get is a rather clean cut and a good separation between leaded and non-leaded glass. The machinery costs for the whole assembly around $40,000. We thought that was the best way to move into the future based on the dwindling CRT market, the need to find other alternatives for the glass other than a co-mingled mess that's going over to Asia, and you have more options when you separate. The pros: the initial machinery costs are minimal, it effectively separates leaded funnel from panel glass [a necessity now to export], no lead dust contaminants, there are no air-born contaminants. It doesn't actually melt the glass. It doesn't heat into the glass. It simply heats the glass up, gets the molecules moving enough so that when the cold air hits the molecules stop, and that hot/cold reaction causes the glass to fracture and allows us to separate the 2. It greatly reduces our outbound disposal costs. The first machine that I showed you a few slides back with the hammer mill, our outbound disposal costs for that machine at the end of the year were $500,000 just to find the correct processor to handle that glass, ship it to them, and have them handle it environmentally safely was a minimum of $500,000 costs. On these, what's happened is the glass costs have reversed to where the glass actually has positive value. People want to buy the glass. There are many different vendors who are looking to buy that glass because it is effectively separated. Again this goes back to the basic theory of setting up a recycling facility: how can you do it cost effectively, separate as effectively as possible still using cost effective methods, and create cleaner streams of product that is coming out of your facility. It increases the glass recycling options. Well when the CRT glass industry dries up, and they're

not making anymore CRTs, what is everybody going to do with all the glass that they have? They're going to have to pay the same thing that we were paying a few years ago to dispose of that glass. These machines give a low cost alternative to that. Cons: it's slow, and I'm going to say that again. If you're used to seeing 1 tube every 3-5 seconds and you're processing large amounts of CRT glass, this is not for you. This is for the 65-70% of the people that John's slide showed that are in between the 1-5 million dollars a year range, and believe me you can make a healthy living in that range. This is for the small to medium sized volume generators. It will not take large amounts of glass because it's just too slow of a process.

Examples of separated CRT glass coming out of the wire separators. As you can see, I'm not going to be crazy enough to stand up here and claim that there's no lead on that piece of panel glass. I would be lying. There may be. I don't know. What I needed to find out was: what did I have to do to stop paying to dispose of this glass? What did I have to pay for the machinery to bring that machinery in so that I didn't have to pay $500,000 a year to get rid of that glass? Now granted, we were doing a lot more glass when we were spending that amount of money, but this was a low cost effective way of separating the two. Whether or not there is lead on this glass or not, I don't want to say it's not my problem, but it becomes the problem of the downstream glass recycler. One of the theories that we operate under is let the people focus on what they do best. I'm not in the glass business, however I have to handle glass. If I have to handle it, then I want to make as much money as I can for touching it. This gave us that opportunity to do that. So you see "clean stream", I use that term with quotation marks, "clean stream" of panel glass, relatively clean stream of funnel glass, and large maybe a 3,000 pound bag of separated panel glass. We've had Samsung come in and bid on this glass, both from Korea and Malaysia. We've had most of the local recyclers bid on the glass. Everybody seems to like the glass. I like the fact that we have more options if one of them shuts down or one of them has a problem, and these things happen, we're not stuck with the glass. We have other opportunities to get rid of that glass.

So what have we learned? We learned that the electronic waste industry is constantly changing. What was the best solution for the industry 5 years ago isn't the best solution for the industry today, and it may change again. I'm a firm believer that any recycler has to stay flexible enough to be able to continue to change with the industry. We have LCDs coming into effect now. It's a whole new ballgame. It's more about what John had talked about. It's all about mercury, and mercury retort and effective separation of bulbs. It's a whole process, and I can pretty much guarantee that there is nobody who has perfected it yet. We're all working on figuring out how we can do it cost effectively, labor effectively, machine effectively, and turn it into some revenue because if we don't turn it into revenue, then there is none of us who are going to be recycling at the end of the day. Effective processors should be able to change with the industry. Separating the scrap increases the value in your streams which means more money. Expensive separation equipment does not necessarily produce the cleanest streams. Most electronics have a reasonable value. Creating clean streams of raw material is a combination of manual labor and machines. The reason I said that is because I am a firm believer that if you pull off the copper and pull out the glass before you pulverize or shred, what's coming out the backside is going to be a whole lot more manageable than contaminating it with those other streams. It's hard to get fractions of copper out. It's hard to get glass out especially when it's pulverized. Pulling those things out and then running it through a piece of machinery is much more cost effective, and it'll increase the bottom line. It'll give you a cleaner stream of product. CRTs are a major part of electronic waste stream, and effective CRT glass management is a key to a successful and profitable company. These are things that I think I've learned through the last 6 or 7 years in this industry. The beauty of whoever is thinking about doing this in Mexico is: you get to look at all these different options and pick and choose what's best for you. It's an ideal situation. Thank you very much, that is my presentation.